ILLUSTRATIONS

WITHDRAWAL OF THE

LIQUOR AMNII AND YOLK SAC FLUID

FROM THE RABBIT'S UTERUS

ITS EFFECTS

ON FOETUS AND PLACENTA

BY

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Figs. 1-10 . Naked eye appearances of the whole uterus and of the individual sacs.

Fig. 1.

Transverse section of a 10 days gestation sac.

M.P. , maternal placenta made of S , region of uterine sinuses , and I , intermediary region. F , foetal placenta. E , embryo in transverse section surrounded by amnion , A. Al , allantois. U , uterine wall. Y , vascular wall of yolk sac; Y' , non vascular wall in contact with inner wall of uterus except in places where it has been artificially detached. Between these two is the cavity of the yolk sac , Y.C. C , extra embryonic body cavity.

Fig. 2.

Transverse section of a 16 days gestation sac.

This section is towards one end of the sac so that the greatest depth of the foetal placenta is not seen. The foetus , cut obliquely, is in the middle of the sac. The amnion is not shown but it follows the inner surface of the invaginated vascular yolk sac wall which is shown closely applied to the wall of the sac - Y. Al , allantois.

Fig. 1

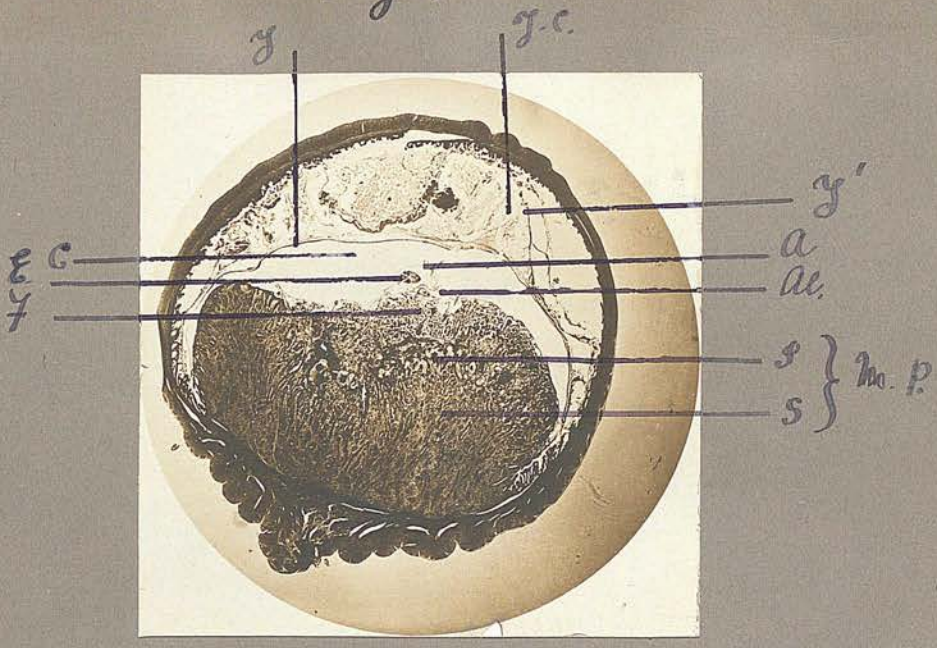


Fig. 2

Fig. 3.

Exp. I. Complete uterus with part of vagina , removed post mortem - interval between operation and death of animal , 3 days.
Note the three large normal sacs to the left and the two smaller punctured ones to the right. N , normal sacs in right horn. P , punctured sacs in left horn. V , vagina. S , site of excision of the vaginal sac of each horn.

Fig. 4.

Exp. I. Transverse sections of sacs removed post mortem - interval between operation and death of animal , 3 days.
A , transverse section of normal sac from right horn. B , transverse section of distal punctured sac of left horn. Note the thickening of the uterine wall , the small space between the face of the placenta and the roof of the sac , and the lateral compression of the placenta so that the two lobes are approximated. M , maternal placenta. F , foetal placenta.

Fig. 3

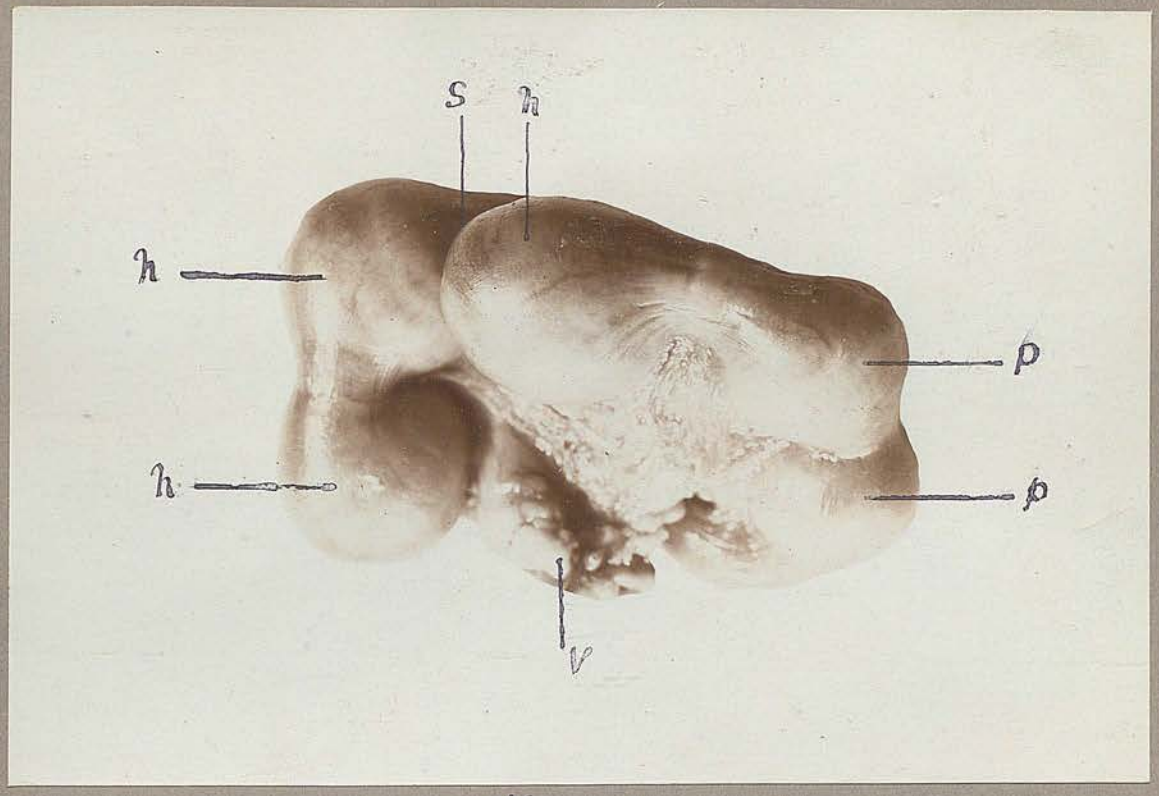


Fig. 4

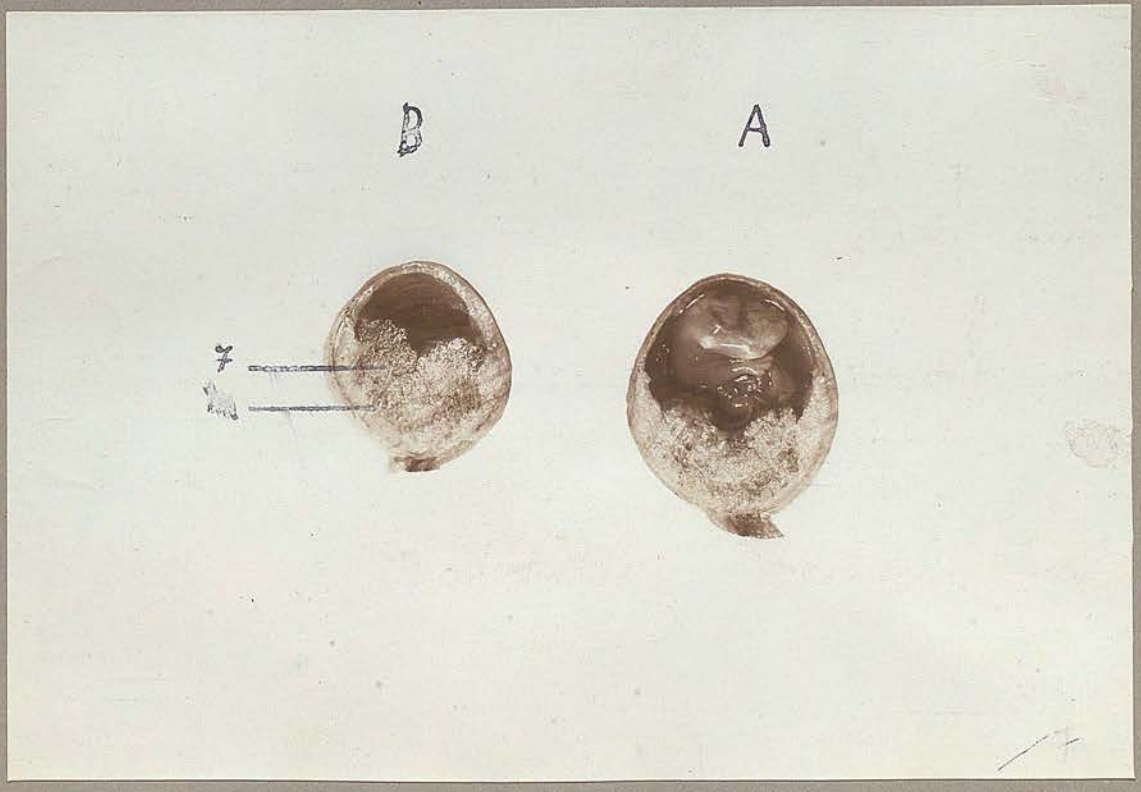


Fig. 5.

Exp. I. Showing two sacs from the uterus - interval between operation and death of animal , 3 days.

A , normal sac from right horn , removed post mortem. The roof of the sac has been dissected away to show the relation of the foetus in its membranes. B , proximal punctured sac from right horn , removed post mortem. Note the foetus lying on the surface of the placenta and flattened out laterally. It is still enclosed in its amniotic sac - contrast with A. C , foetus from one of the normal sacs of the left horn , removed post mortem. D , foetus from the distal punctured sac of the left horn , removed post mortem. It shows the development of an ordinary 16 days embryo and is flattened out. It must therefore have died very soon after the operation.

Fig. 5

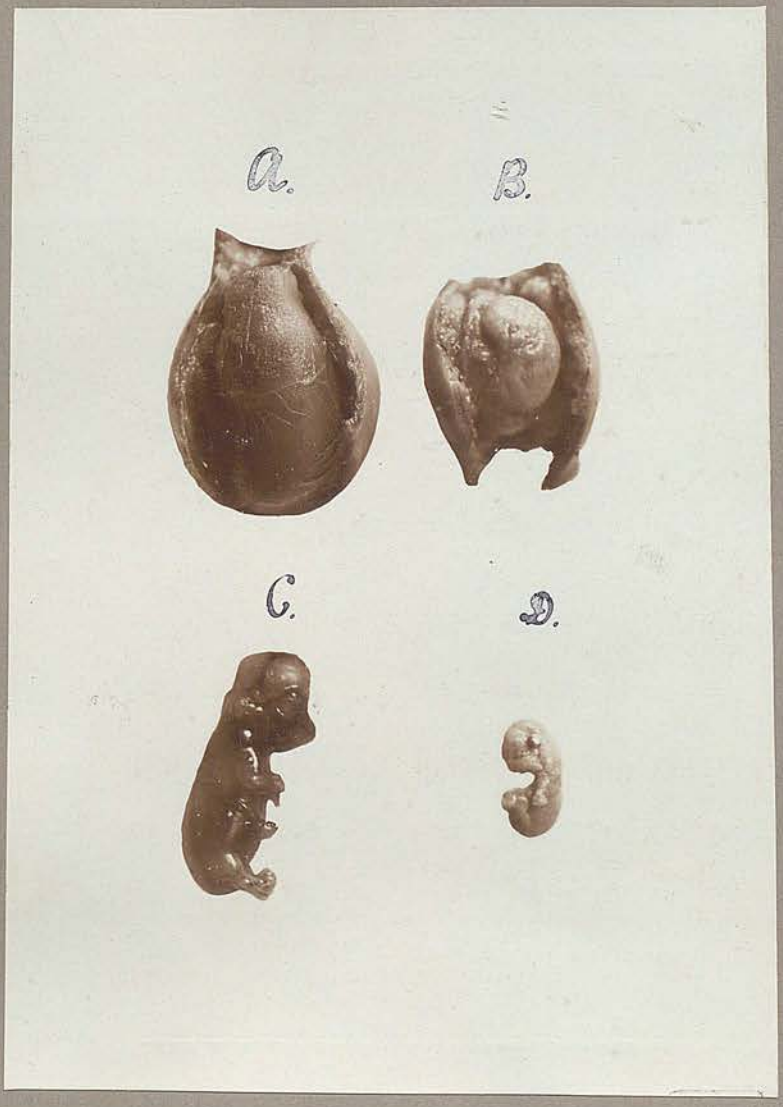


Fig. 6.

Exp. II. Whole uterus removed post mortem , showing the contrast between the normal and the punctured sacs - interval between operation and death of animal , 5 days.

N , normal sacs of left horn. P , punctured sacs of right horn.

S , scar at site of sac excised at operation. M , mesometrium.

Note that there is no bulging of the roof of the aspirated sacs , such as is present in the normal ones from the presence of a quantity of fluid.

Fig. 6

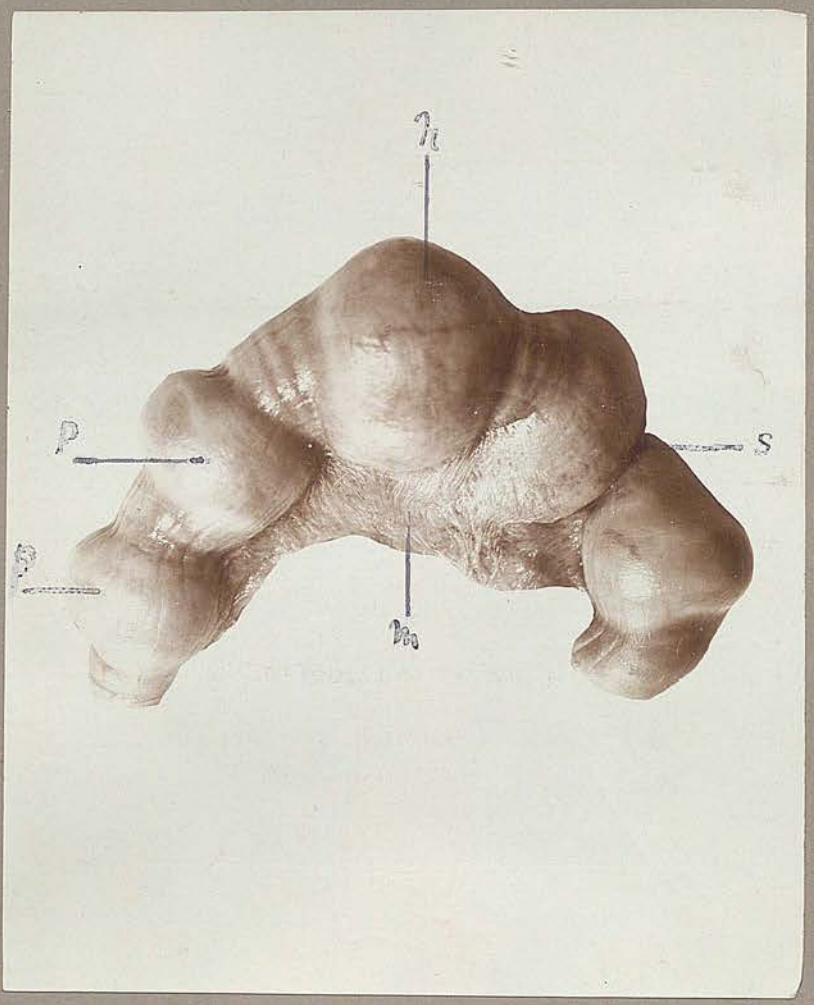


Fig. 7.

Exp. III. The uterus entire , removed post mortem - interval between operation and death of animal , 7 days.

N , normal 21 day sacs in the right horn. P, Punctured vaginal sac of right horn and of left horn. S , site of sac excised at operation. Note the contrast in size between the normal and the punctured sacs , and also the firm rounded appearance of the latter owing to the absence of fluid. V , vagina. M , mesometrium.

Fig. 8.

Exp. III. Transverse sections of sacs of uterus - interval between operation and death of animal , 7 days.

A , normal sac excised at operation - 14 days pregnant. B , normal sac removed post mortem - 21 days pregnant. C , punctured left horn sac removed post mortem. Note that the punctured sac has not increased in size since the time of operation , that its wall is markedly thickened , that the space between the placenta and the roof of the sac is very narrow , and that the foetus (F') lies flattened out between them. The placenta is compressed laterally so that its lobes are approximated. The distinction between the maternal (M) and foetal portions (F) is not so marked as in the normal sac. Note that in the 14 day sac no zone of separation (S) is differentiated , that it is only faintly visible in the normal 21 day sac , and that it is very well marked in the placenta of the punctured sac.

Fig. 7

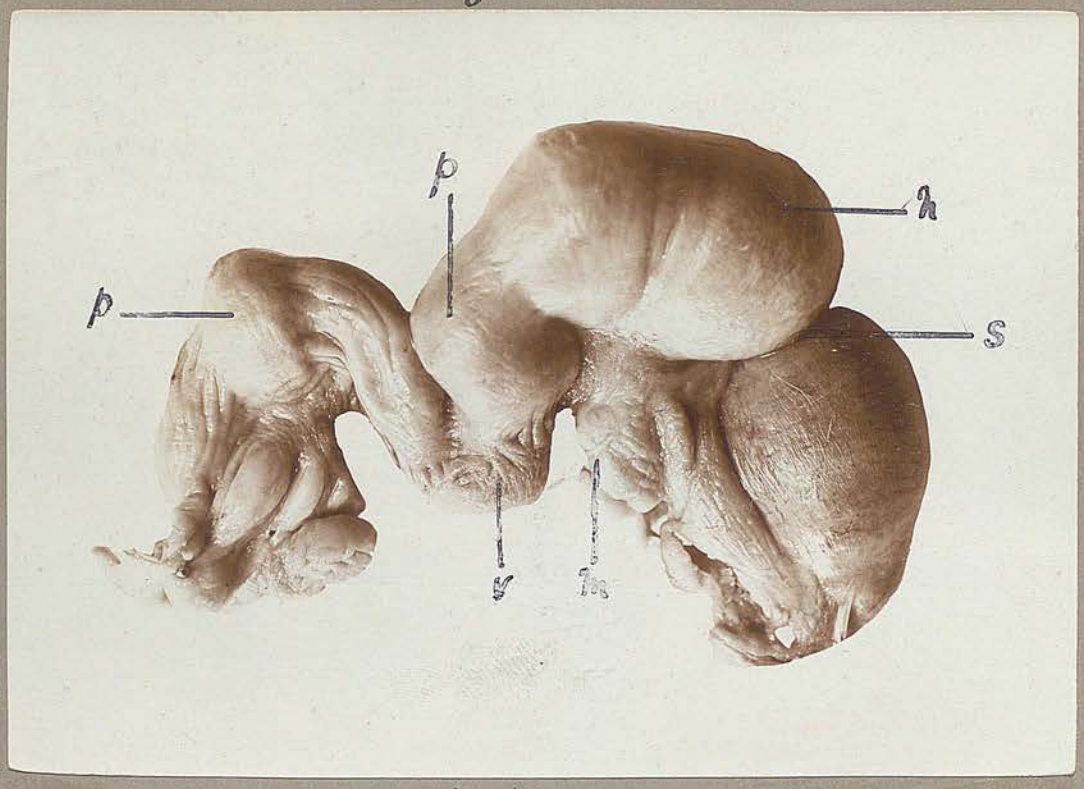


Fig. 8

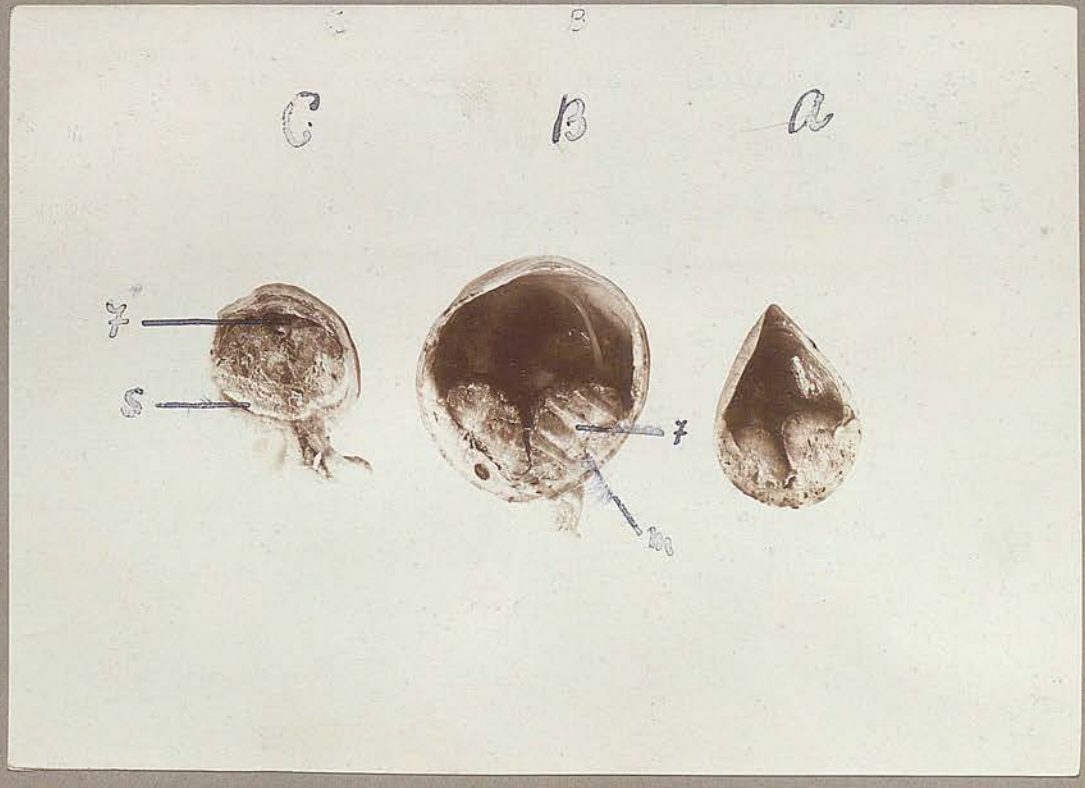


Fig. 9.

Exp. IV. Complete uterus excised post mortem - interval between operation and death of animal , 7 days.

R , right horn. L , left horn. P1 , P2 , P3 , aspirated sacs. Note that they are smaller than the normal ones. In the sac of P3 the ovum was found detached from the wall of the cornu. It is shown in fig. 10 , F.

Fig. 9

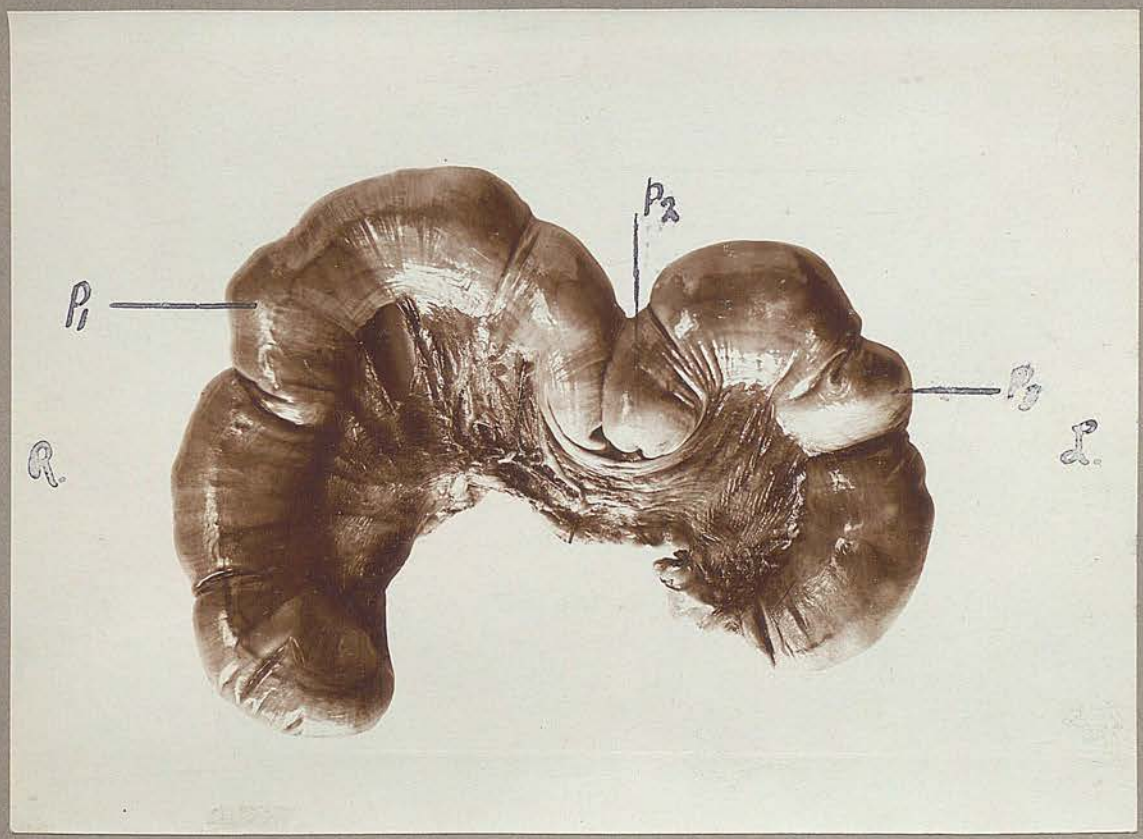
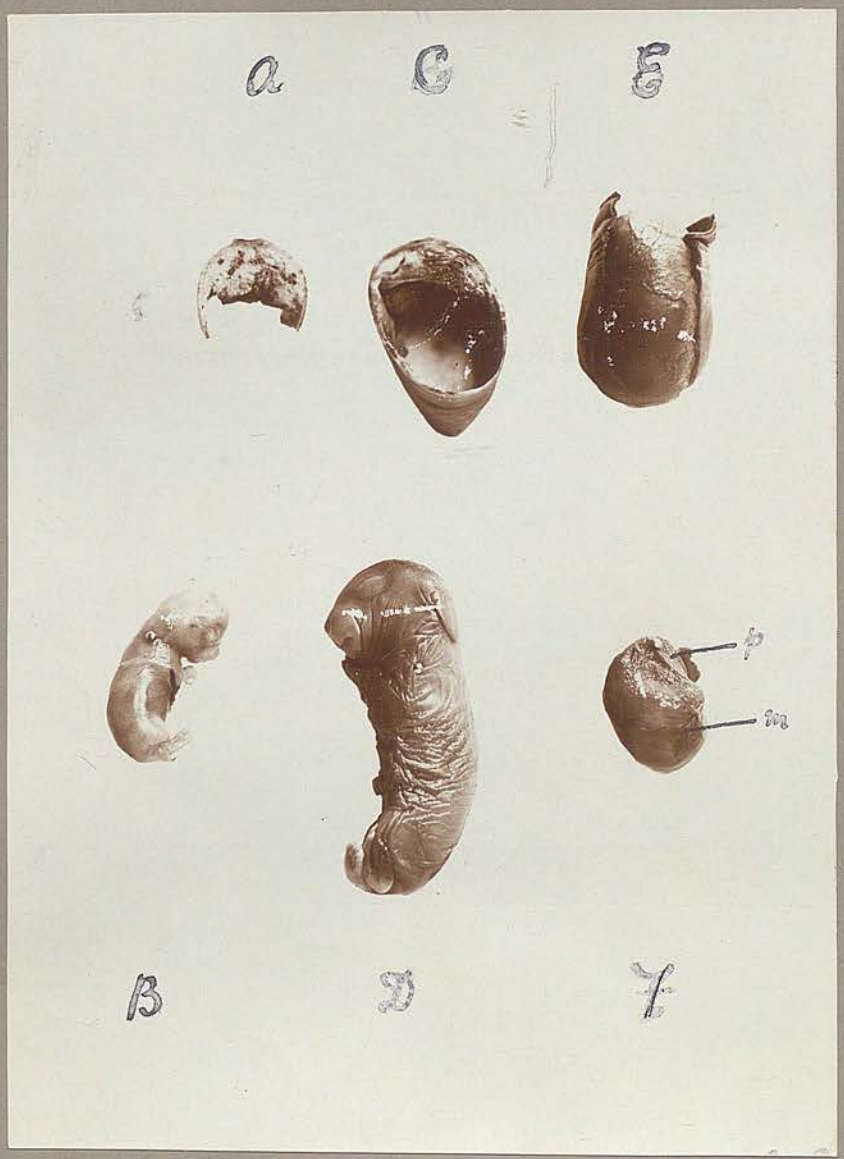


Fig. 10.

Exp. IV. Sacs and foetuses from uterus shown in fig. 9.

A , placenta of normal sac excised at operation. B , normal 21 days foetus from sac A. C , normal sac from right horn , removed post mortem. D , normal 28 days foetus from sac C. E , aspirated sac from left horn , showing amnion closely investing foetus and containing no fluid. F , whole ovum found lying detached in the aspirated left horn sac; p , placenta; m , membranes closely investing foetus and containing no fluid.

Fig. 10



Figs. 11-22. Microscopic appearances of the maternal placenta of the normal and aspirated sacs.

Fig. 11.

Exp. V. Transverse section of aspirated sac - interval between operation and death of animal , 9 days.

Note the thickening of the uterine wall - compare with fig. 2 - the lateral compression of the placenta and the small space between it and the roof of the sac in which lies the degenerated and flattened foetus , F. The dark material filling up the rest of the space is inspissated mucus.

Fig. 12.

Exp. VII. Transverse section of aspirated sac - interval between operation and death of animal , 12 days.

Note the thickened uterine wall and the compression of the placenta from side to side. The degenerated foetus , F , is flattened out between the roof of the sac and the placenta. The vascular wall of the yolk sac , Y , is seen , and within it the amnion which closely invests the foetus.

In the maternal placenta the zone of separation , S , is very distinct and the rest of it is mostly composed of fibrin. The foetal placenta still retains the horse shoe shape of each lobe and is invaded by fibrin.

Fig. 11

Fig. 12

Fig. 13.

Exp. I. Part of the maternal placenta of a normal 16 days sac. U , uterine wall. S , dilated uterine sinus lined by swollen endothelium. F , commencing fibrinous deposit in the region of the uterine sinuses. The part seen below this will develop into the zone of separation , but as seen , this is as yet only faintly differentiated. The whole of the tissue is composed of uninucleated decidual cells. x 50.

Fig. 14.

Exp. II. Uterine wall and zone of separation of normal 17th day placenta.

Shows the two layers of muscle - circular and longitudinal in the uterine wall , and the uninucleated decidual cells which form the zone of separation. x 50.

Fig. 13

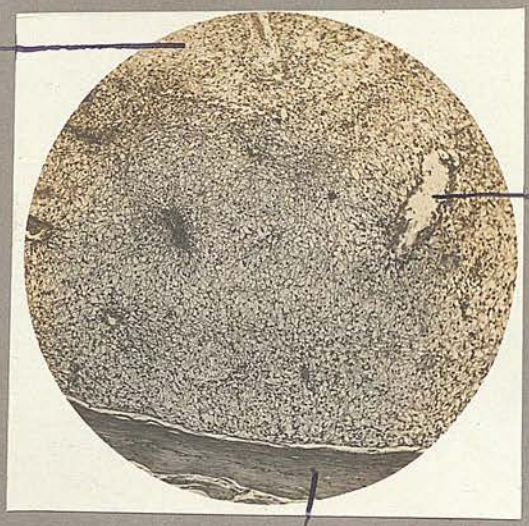


Fig. 14

Fig. 15.

Exp. II. Uterine wall and zone of separation of punctured sac removed post mortem - interval between operation and death of animal , 5 days. Note the thickening of both layers of the muscular coat as contrasted with fig. 14 , and also the looser arrangement of the cells forming the zone of separation , due to their shrunken condition. There is no fibrin deposit in this part. x 50

Fig. 16.

Exp. VII. Uterine wall , zone of separation , and part of maternal placenta of aspirated sac - interval between operation and death of animal , 12 days.

Note that the fibrinous deposit in the maternal placenta , F , does not invade the zone of separation which is composed of shrunken , uninucleated decidual cells. The tissue has become detached from the uterine wall , W , in places and the whole placenta is on the point of being cast off. x 50.

Fig. 15

Fig. 16

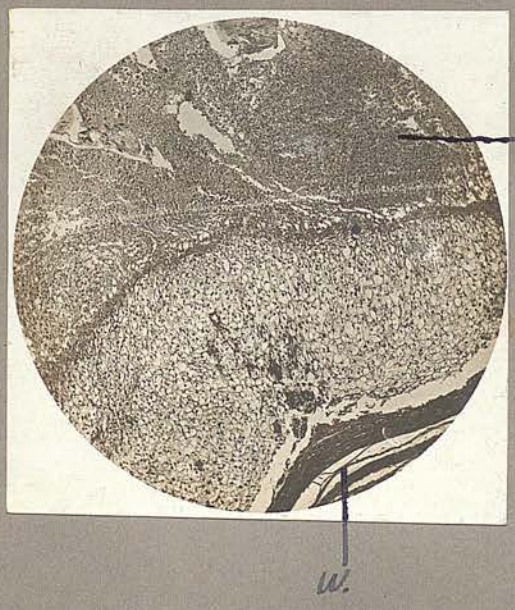


Fig. 17.

Exp. IV. Part of maternal placenta and zone of separation of aspirated sac - interval between operation and death of animal , 7 days. The placenta has become completely detached from the uterine wall and this has taken place through the zone of separation , S , the edge of which is ragged. Note that there is no fibrinous deposit in this part. S', is a dilated uterine sinus with fibrin walls. Round it can be seen the remains of decidual cells. x 50.

Fig. 17

Fig. 18.

Exp. II. Junction of foetal and maternal tissues in normal 17th day placenta. F , foetal placenta. M , maternal placenta. Note the foetal ectoderm (E) extending deeply into the maternal placenta along the walls of the uterine sinuses which are surrounded by multinucleated decidual cells (D). The nuclei of the foetal ectoderm stain well , and the whole tissue is loose with bands of mesoderm (M) throughout. x 50.

Fig. 19.

Exp. II. Junction of foetal and maternal tissues in placenta of aspirated sac - interval between operation and death of animal , 5 days.

Note that the foetal ectoderm has ceased to penetrate into the maternal placenta - contrast with fig. 18; that the ectoderm is more closely arranged owing to the compression of the mesoderm , and that the cells stain more faintly and the nuclei are paler. In the maternal placenta there is more lymph deposit and debris which has replaced many of the multinucleated decidual cells , so that it more closely resembles the normal 21 days placenta as shown in fig. 20 than the 19 days one as seen in fig. 18. x 50.

Fig. 18

Fig. 19

Fig. 20.

Exp. III. Junction of foetal and maternal tissues in normal 21 days placenta.

The ectoderm still has the power of penetrating the maternal placenta and it still retains its clear nuclear staining. Note the increased fibrinous and lymph deposit in the maternal placenta which has compressed and replaced the decidual cells. F , foetal ectoderm. D , multinucleated decidual cells. L , fibrin and lymph deposit. x 50.

Fig. 21.

Exp. III. Junction of foetal and maternal tissues in placenta of aspirated sac - interval between operation and death of animal , 7 days.

The foetal ectoderm shows no tendency to proliferate into the maternal placenta and its cells are deficient in nuclear staining. In the maternal placenta there is an excess of fibrin deposit but it occurs in the same situations as normal , viz , round the walls of the uterine sinuses (S) and extending from them out among the decidual cells. x 50.

Fig. 20

Fig. 21

Fig. 22.

Exp. IV. Placenta of aspirated sac - interval between operation and death of animal , 7 days.

Shows the line of junction of the foetal (F) with the maternal placenta (M). Note in the maternal placenta the large sinus with walls composed of laminae of fibrin and with no endothelial lining. Round it are the remains of the decidual cells. The rest of the area is chiefly made up of fibrin and cell debris. In the foetal placenta note that the ectoderm next the maternal tissue is fairly normal in appearance although there is no proliferation or extension into it. In the more central parts of the foetal placenta the ectoderm is extensively degenerated. x 50.

Fig. 22

Figs. 23-28. Degenerative changes in the foetal placenta.

Fig. 23.

Rxp. I. Normal foetal placemta at 16th day.

Note the subdivision of the foetal ectoderm into columns by the invading mesoderm , carrying in it blood vessels (M). The mesoderm is a loosely arranged tissue with scattered branching cells , and the vessels in it are numerous and large. There is no fibrin deposit in any part. x 50

Fig. 24.

Exp. I. Foetal placenta of aspirated sac - interval between operation and death of animal , 3 days.

In contrast to fig. 23 note that the ectodermic columns are more closely packed together with a corresponding diminution in the thickness of the mesodermic bands between them. The mesoderm at the surface contains no dilated vessels , and in it are fine threads of fibrin and some lymph deposit. The cells of the ectoderm are beginning to show degenerative changes in the central areas as evidenced by the deficient nuclear staining. x 50.

Fig. 23

Fig. 24

Fig. 25.

Exp. II. Foetal placenta of aspirated sac - interval between operation and death of animal , 5 days.

The ectodermic columns are more compressed than in fig. 24 and the mesoderm between them less abundant. The fibrinous deposit in the surface mesoderm is denser and the degeneration of the ectoderm more marked. Y, is the collapsed and wrinkled wall of the yolk sac. x 50.

Fig. 26.

Exp. III. Foetal placenta of aspirated sac - interval between operation and death of animal , 7 days.

The compression of the placenta is so great as to make the division into columns almost unrecognisable. The fibrinous deposit in the surface mesoderm (M) is denser than in figs. 24 and 25 and there is the same absence of vessels. In the strands of mesoderm extending into the placenta there is also fibrin tissue. The ectoderm is very extensively degenerated so that cell outlines cannot be recognised in the central areas , although towards the foetal and maternal surfaces they are still distinct. x 50.

Fig. 25

Fig. 26

Fig. 27.

Exp. VII. Foetal placenta of aspirated sac - interval between operation and death of animal , 12 days.

The division of the ectoderm into columns is no longer recognisable and it is only in certain areas that the ectoderm can be recognised at all. For the most part it is replaced by fibrin tissue. The mesoderm at the surface is also densely invaded with fibrin coagulated lymph and cell debris. M , surface mesoderm. F , fibrin deposit replacing ectoderm. x 50.

Fig. 28.

Exp. VIII. Foetal placenta of aspirated sac - interval between operation and death of animal , 14 days.

The ectoderm has almost completely degenerated but it is still recognisable in patches where it is in contact with maternal tissue containing blood. There is a great deal of fibrin and debris in the mesoderm. x 50.

Fig. 27

Fig. 28

Figs. 29-42. Degenerative changes in the foetal tissues.

Fig. 29.

Exp. I. Connective tissue and surface epithelium of normal 16th day foetus.

Note the loose myxomatous character of the tissue with the scattered spindle shaped branching cells and the numerous blood vessels. The epithelium on the surface is in a single layer. x 250.

Fig. 30.

Exp. III. Connective tissue of degenerated foetus - time of retention in utero , 7 days.

Note that the surface epithelium is absent. The connective tissue has an entirely different appearance from that in fig. 29. The nuclei of the cells are swollen and the latter have lost their protoplasmic processes so that they have a rounded appearance. The granules in the nuclei are not well shown. Blood vessels are scarcely distinguishable. Y , yolk sac wall which has lost its epithelial covering. The mesoderm contains blood vessels with degenerated corpuscles. A , shrivelled wall of amnion. x 250.

Fig. 29

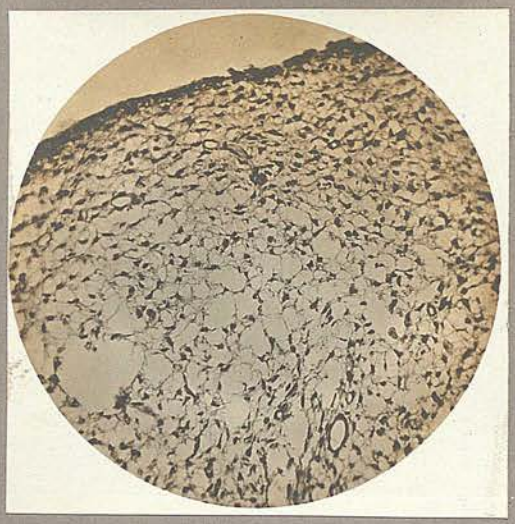


Fig. 30

Fig. 31.

Exp. I. Heart wall of normal 16th da, foetus.

V , wall of ventricle. T , muscular trabeculae. The muscle fibres show faint striation. The nuclei stain deeply and cell outlines are distinct. The cavity is every where lined by a fine endothelium. One or two nucleated red blood corpuscles are visible in the cavity; others are blurred in outline owing to their movement across the field while the photograph was being taken. x 250.

Fig. 32.

Exp. I. Heart muscle of degenerated foetus - time of retention in utero , 5 days.

The fibres have begun to break up and nuclear staining is very deficient. The great part of the heart wall is made up of degenerated connective tissue cells. The endothelial lining is lost in places and no corpuscles are visible in the cavity though their debris is present. x 250.

Fig. 31

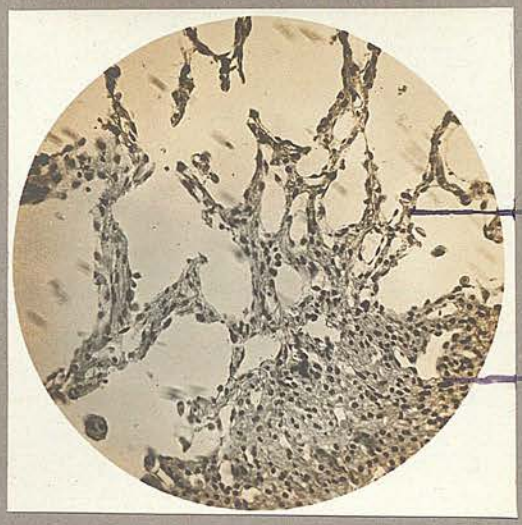


Fig. 32

Fig. 33.

Exp. II. Heart muscle of degenerated foetus - time of retention in utero , 7 days.

Note the blurred outlines of the muscle cells and their loss of striation. The nuclei stain faintly and are granular. In some of the trabeculae nuclear staining is absent. The connective tissue cells (A) have undergone the same degenerative change as is seen in fig. 30. The endothelium (B) is raised off the surface of the wall and is being shed into the cavity. The red blood corpuscles (C) in the cavity are shrivelled and shrunken. x 250.

Fig. 34.

Exp. VII. Heart fibres of degenerated foetus - time of retention in utero , 12 days.

All that remains of the heart muscle is a collection of degenerated fibres which are irregularly arranged and are detached from each other. The heart wall is made up of the degenerated connective tissue cells which have resisted the breaking down process longer than the muscle fibre.

Fig. 33

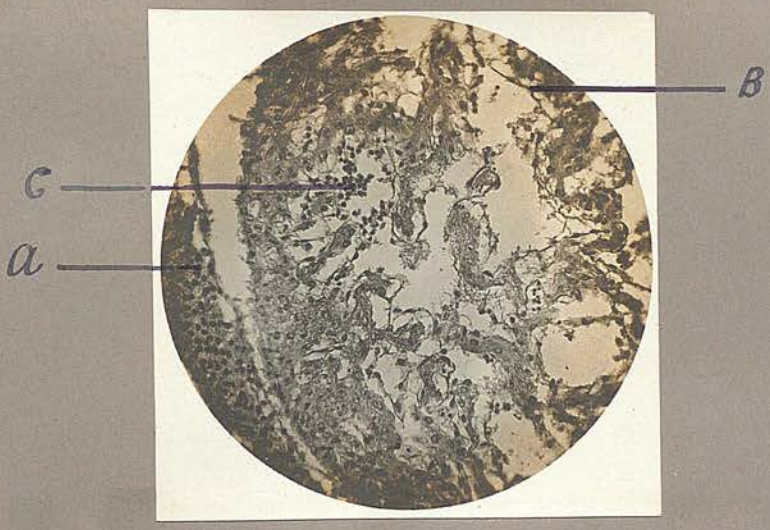


Fig. 34

Fig. 35.

Exp. 1. Liver of normal 16th day foetus.

Note the tubular or columnar arrangement of the liver cells. Each cell has a distinct outline and a darkly staining nucleus. The stroma is abundant and is loose and open. The blood vessels are numerous and contain nucleated red blood corpuscles (V). x 250.

Fig. 36.

Exp. I. Liver of degenerated foetus - time of retention in utero , 3 days.

Note the shrinking of connective tissue; the indistinct outlines of the liver cells and the faint nuclear staining. Numerous giant cells are present (G). The blood corpuscles between the columns of liver cells are beginning to break down. x 250.

Fig. 35

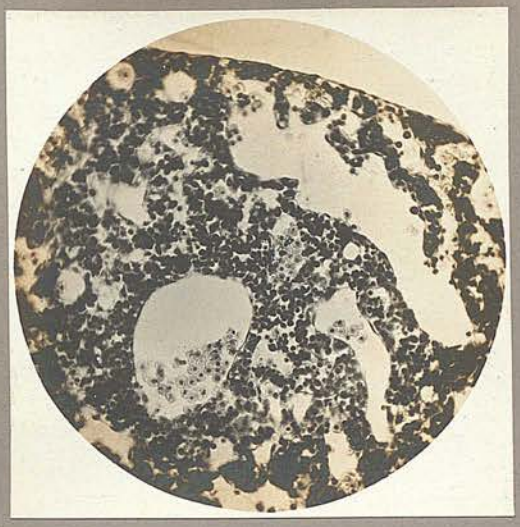


Fig. 36

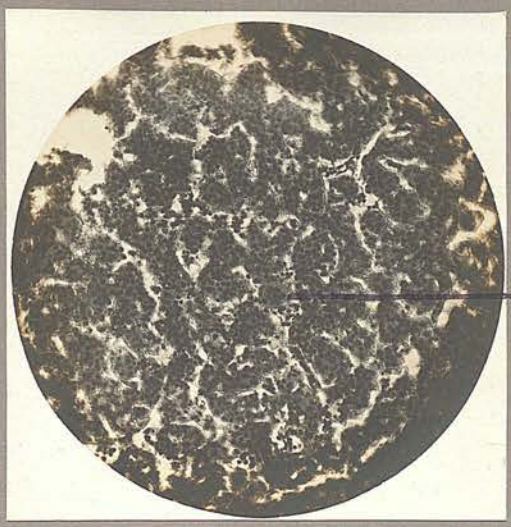


Fig. 37.

Exp. II. Liver of degenerated foetus - time of retention in utero , 5 days.

The outlines of the liver cells are blurred. The granular degeneration of their nuclei is well seen. The protoplasm of some of the cells has begun to break down and the debris lies in the spaces between the liver cells , along with that derived from the broken down blood corpuscles. No normal blood corpuscles are present. x 250

Fig. 38.

Exp. IV. Liver of degenerated foetus - time of retention in utero , 7 days.

Note the blurred outlines of the liver cells and the faint granular staining of the nuclei. The debris , which is everywhere present , is derived from the broken down protoplasm of the liver cells and blood corpuscles. x 250.

Fig. 37

Fig. 38

Fig. 39.

Exp. I. Kidney of normal 16th day foetus.

G , glomeruli containing nucleated red blood corpuscles. T , tubules lined by cubical epithelium with round , darkly staining nuclei. C , myxomatous connective tissue containing many blood vessels. x 250.

Fig. 40.

Exp. I. Kidney of degenerated foetus - time of retention in utero , 3 days.

The glomeruli (G) are shrunken and contain little blood. The epithelium of the capsules is being shed. The epithelium of the tubules is swollen and the protoplasm is breaking down at the free margin , the debris accumulating in the lumina , while the nuclei are faintly granular. The connective tissue has lost its myxomatous character and resembles that shown in fig. 30. x 250.

Fig. 39

Fig. 40

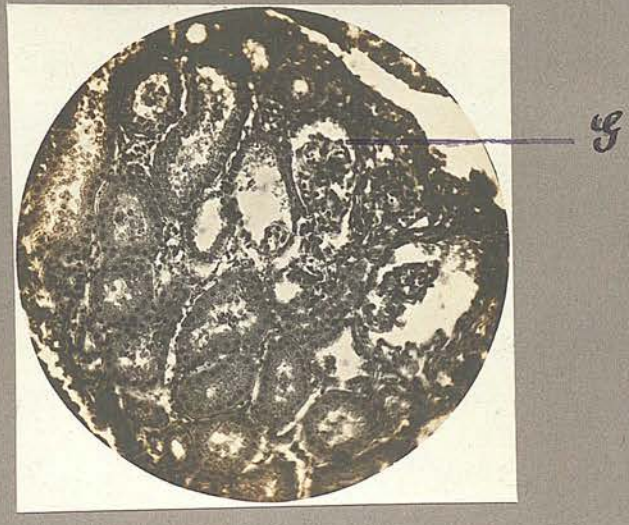


Fig. 41.

Exp. VII. Kidney of degenerated foetus - time of retention in utero - 12 days.

The glomeruli (G) are shrunken and contain no blood. The epithelium of the capsules has disappeared. The epithelium of the tubules is in many cases completely detached and lying free in the lumen. What remains is swollen , with individual cell outlines indistinguishable , and swollen granular nuclei. The connective tissue shows the same degenerative change as in fig. 30. x 250.

Fig. 42.

Exp. IV. Cartilage and muscle fibres of degenerated foetus - time of retention in utero , 7 days.

The ground substance of the cartilage is not altered but the cells are shrivelled and the nuclei granular.

The muscle fibres are breaking up longitudinally: they stain irregularly and the nuclear staining is faint. x 250.

Fig. 41

Fig. 42